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ELECTRICAL POSITION RESOLVER ARRANGEMENTS

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ABSTRACT OF THE DISCLOSURE

A position resolver having a resistive layer to which two pairs of conductive strips are connected is described. Two input signals of different frequencies are applied respectively to each pair of strips. A probe, movable across the layer, picks up signals compounded of frequencies in proportions dependent on the position of the probe on the surface. Signals of the first and second frequencies are separated at the output of the probe. A portion of the separated signal of the first frequency is applied as feedback to the pair of strips to which a signal of that frequency is not normally applied and, similarly, a portion of the separated signal of the second frequency is applied as feedback to the pair of strips to which a signal of that frequency is not normally applied to correct errors caused by field distortion. The inputs may be applied in push pull balanced feed.

This invention relates to arrangements including what are herein termed electrical position resolvers, that is to say devices wherein the position of a member relative to a surface across which said member is movable is resolved and translated into two electrical signals representative respectively of the two co-ordinates of position of said member. More specifically the invention relates to arrangements including electrical position resolvers of the kind wherein the surface is provided with a resistive layer to which connection is made by means of two pairs of parallel strips, those of one pair being perpendicular to those of the other, and different input frequencies are applied between the strips of each pair, the movable member being a pick-up probe which is movable over said surface and is adapted to pick up signals compounded of different input frequencies in proportions dependent on the position of said probe on the surface.

The invention is illustrated in and explained in connection with the accompanying drawings in which FIGURE 1 shows diagrammatically a typical known electrical position resolver of the kind referred to and FIGURES 2 and 3 show diagrammatically two embodiments of this invention.

Referring to FIGURE 1 the known electrical position resolver therein illustrated consists of a base plate A, e.g. a glass plate which might, in typical practice, be a square plate with a side of, say, 10", on which is deposited a thin layer (not separately shown) of suitable resistive material. Connection to the resistive material is made by means of two pairs X1, X2 and Y1, Y2 of connecting strips lying along the sides of a square, the strips of each pair being parallel. Two different readily separable input frequencies f_1 and f_2 are applied to the two pairs of strips. They may be applied, as shown, in push-pull between the strips of the respective pairs—this balanced input feed is the one usually preferred—or, of course, a "single sided" feed may be used one strip in each pair being earthed and the two frequencies being applied to the other two strips, one in each pair with respect to earth. The resistive layer deposit is covered with a hard insulating layer to protect it and a probe P is movable over the insulating layer, making capacitative coupling with the resistive layer through the insulating layer at whatever position the probe may occupy. The amplitude of the signal of frequency f_1 picked up by the probe P will depend upon its position between the two strips X1 and X2 and similarly the amplitude of the signal of frequency f_2 picked up by the probe will depend on its position between the two strips Y1 and Y2. If, therefore, the output from the probe is filtered to separate the two frequency components and the separated components amplified and rectified, the resultant D.C. signals will be representative of the co-ordinates of the position of the probe. Where the input frequencies are applied in push-pull between the strips of the respective pairs i.e. balanced input feeds are employed, the detector should be of any well known type adapted to provide rectified output signals of one polarity from a frequency which is in phase coincidence with a reference frequency, and rectifier output signals of the opposite polarity from a frequency in phase opposition to a reference frequency. The reference frequency can most conveniently be derived from the input frequency. In any case the resultant rectified signals can be utilised in any desired way, e.g. fed into a computer or presented to a display device such as a cathode ray tube, or employed to perform a desired control function.

Ideally the fields produced by the input frequencies f_1 and f_2 should be uniform and everywhere mutually perpendicular. In practice, however, this ideal is not realised and quite substantial distortion of the fields occurs, particularly at the corners of the area on the sides of which the strips lie and at and near the edges of that area, in which region the field lines tend to become materially curved instead of remaining straight. Such field distortion obviously produces lack of fidelity of the signal components picked up by the probe. Errors of this nature can, as is known, be corrected by subjecting the separated probe output signal components to non-linear amplification to introduce compensation for the errors which would otherwise occur, but such non-linear amplication does not provide a practically satisfactory solution of the problem in part because the amplifiers required are expensive and difficult to design and in part because the requirement that there shall be stability of the chosen non-linear law of amplification is difficult to satisfy. The present invention seeks to solve the problem without having recourse to non-linear amplification.

According to this invention an arrangement including an electrical position resolver of the kind referred to comprises means for applying component frequency signals derived from the output pick-up probe of said resolver as auxiliary correcting input potentials to said resolver substantially to compensate for and correct errors which would otherwise be caused by distortion of the fields produced by the normal different frequency inputs.

In one way of carrying out the invention there is superimposed upon each of the two normal inputs of different frequencies an auxiliary correcting input potential which is of the other frequency and is derived from the probe output. In one embodiment of this nature each of the two normal inputs of different frequencies is applied to one or other of two mutually perpendicular strips of the resolver through a rejector circuit tuned to reject the other frequency, there being also applied to each of said strips an auxiliary correcting input potential which is of a frequency different from that of the normal input to said strip and is applied thereto through a rejector circuit tuned to reject the frequency of said normal input.

In another way of carrying out the invention each of the two normal inputs of different frequencies is applied in push-pull between the strips of one or other of the two pairs of strips by means of a circuit which includes a